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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/594,676	08/01/2007	Masanori Yamamoto	1417-552	1582

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EXAMINER	
FANG, SHANE	

ART UNIT	PAPER NUMBER
4131	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/594,676	YAMAMOTO ET AL.	
	Examiner	Art Unit	
	SHANE FANG	4131	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08/01/07*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09/28/06* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/28/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-8, 11-12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Iida et al. (US 4656241 A).**

Iida et al. discloses a method for producing of a polybutylene terephthalate (PBT) by reacting a dicarboxylic acid component containing terephthalic acid (TPA) as a main constituent directly with a glycol component containing 1,4-butanediol (BG) as a main constituent. *Iida et al*. further discloses the use of Ti-based catalysts for the PBT manufacturing process containing esterification and polycondensation steps.

As to claim 1, *Iida et al*. discloses an esterification process of producing of a polybutylene terephthalate via di-n-butoxybis(triethanolaminate)titanium (Example 8). The reference differs from claim 1 by failing to disclose a range with sufficient specificity to anticipate the claimed range of β value (4.0-7.0). However, the reference teaches ranges of pressure (500 mmHg=66.7 kPa), BM/TM ratio (1.6), α (22.7 ppm), and resultant β (3.92) that overlaps the claimed range, and it has been held that overlapping ranges are sufficient to establish *prima facie* obviousness. See MPEP 2144.05. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected from the overlapping portion of the range taught

by the reference because overlapping ranges have been held to establish *prima facie* obviousness.

As to claims 2 and 6, the reaction pressure of esterification disclosed in Example 8 is 500 mmHg (66.7 kPa), falling in the range recited in claim 2 and 6.

As to claims 3 and 4, the reference (Example 8) shows the reaction pressure is 500 mmHg (66.7 kPa); the BM/TM ratio (as defined in claim 1) is 1.6; α (as defined in claim 1) is 22.7 ppm (calculated based on data disclosed in Example 8). Consequently, the value of β is 3.92. The disclosed process is almost identical to claimed invention except the value of β is slightly lower than that of claimed range (4.0-7.0), as the result of using a slightly lower BM/TM ratio of 1.6. The reference further teaches the esterification of TPA and BG will not proceed unless a large amount of BG is fed in this esterification reaction to offset the side reaction of producing by-produced THF (Col 1, ll 42-46) and reduce the reaction time (Col 1, ll 58-60).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have incorporated disclosures of *Iida et al*. to develop a process of producing PBT via by increasing of the BM/TM ratio in order to fit the empirical formula recited in claims 1, 3, and 4. The suggestion/motivation would have been to offset the side reaction of producing by-produced THF and reduce the reaction time.

As to claim 5, the esterification uses di-n-butoxybis(triethanolaminate)titanium at the loading of 22.7 ppm of Ti based on the weight of final PET product (Example 8).

As to claim 7, the reference fails to teach the property recited in claim 7. However, one ordinary skill in the art would expect that the process and motivation

disclosed by the reference (Example 8; Col 1, ll 42-46; Col 1, ll 58-60) would result in a PBT having the same property of solution haze recited in claim 7.

As to claim 8, the reference further teaches the sequential addition of BG (Example 8) and Ti-based catalyst to the liquid phase portion of the reaction solution. The first addition of BG is 62.5 wt% of total BG, and the first addition Ti-based catalyst is also more than 10% of total Ti-based catalyst.

As to claim 11, the reference teaches that catalytic activity may be lost by water created in the esterification process (Col 5, ll 62-64). The reference differs from this claim by failing to disclose an example falling within the claimed range of water impurity. It is well known alcohols absorb water, and water impurity can be minimized by distillation of Ti-based catalyst solution in BG before adding to the reaction mixture. The normal desire of scientists or artisans to improve upon that is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages. **In re Peterson**, 315 F.3d at 1330, 65, USPQ2d at 1382. In this particular case, the motivation can be to improve catalytic activity by minimizing the water impurity in catalyst solution.

As to claim 12, the reaction temperature of esterification disclosed in Example 8 is 230 ºC at 500 mmHg (66.7 kPa). It is known that the boiling point of BG is 230 ºC at 100 kPa. Thus, the disclosed reaction temperature, 230 ºC, is expected to be higher than the boiling point of BG at the disclosed reaction pressure, 66.7 kPa.

As to claim 15, the reference disclosed the esterification is carried out in a vessel in one stage.

3. Claims 9-10 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Iida et al. (US 4656241 A)** as applied to claim 1 above, and further in view of **Heinze et al. (US 4499261 A)** and **Hoeschele (US 3801547 A)** .

Iida et al. discloses a method for producing of a polybutylene terephthalate (PBT) by reacting a dicarboxylic acid component containing terephthalic acid (TPA) as a main constituent directly with a glycol component containing 1,4-butanediol (BG) as a main constituent in assistance of Ti-based catalysts. *Iida et al*. implicitly teaches the distillation of BG using rectification column (Example 8). *Iida et al*. fails to disclose the use of re-circulated BG for esterification and solution of Ti-based catalyst in BG.

Heinze et al. discloses a multi-stage continuous process of producing PBT, where volatilized BG is recycled (re-circulated) to the initial esterification stage for reaction (Claim 1). *Heinze et al.* further teaches the motivation of using re-circulated BG in the process for saving energy (Abstract).

Hoeschele discloses the making of a solution of tetrabutyl titanate in BG at a concentration of 5.20% (Col 8, Catalyst A). *Hoeschele* implies the motivation of using the solution to eliminate any solid residue of the catalyst (Col 8, Catalyst A).

As to claim 10, the disclosure of *Hoeschele* falls within the range of concentration recited in claim 9 (0.01-20%). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have incorporated disclosures of *Iida et al*. and *Hoeschle* to develop a process of producing PBT via Ti-based catalyst added in the form of solution in BG. The suggestion/motivation would have been to facilitate the raw material feeding and dissolve catalyst to the reaction mixture.

As to claims 9 and 13, it would have been obvious to one of ordinary skill in the art at the time of the invention to have incorporated disclosures of *Iida et al.*, *Heinze et al.,* and *Hoeschele* to develop a process of producing PBT, where Ti-based catalyst added in the form of solution in re-circulated BG, both are not less than 10% by weight used in the esterification reaction. The suggestion/motivation would have been to facilitate the raw material feeding to the reaction mixture, to save energy, and to integrate manufacturing process.

4. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Iida et al. (US 4656241 A)** as applied to claim 1 above, and further in view of **Borman et al. (US 4329444 A)**

Iida et al. discloses a method for producing of a polybutylene terephthalate (PBT) by reacting a dicarboxylic acid component containing terephthalic acid (TPA) as a main constituent directly with a glycol component containing 1,4-butanediol (BG) as a main constituent in assistance of Ti-based catalysts. *Iida et al*. fails to disclose the use of heated BG for esterification.

Borman et al. discloses a PBT production process by reacting TPA and BG, where BG is heated to 175-275 ºC and added for esterification to minimize the contact time between TPA and BG (Abstract). *Borman* further teaches the motivation of minimizing the contact time between TPA and BG (Abstract).

Borman et al. differs from claim 14 by failing to disclose a range with sufficient specificity to anticipate the claimed range of temperature (150-190 ºC). However, the reference teaches ranges of temperature that overlaps the claimed range, and it has

been held that overlapping ranges are sufficient to establish *prima facie* obviousness. See MPEP 2144.05. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected from the overlapping portion of the range taught by the reference because overlapping ranges have been held to establish *prima facie* obviousness. In this particular case, the motivation can be to minimize the contact time between TPA and BG by heating BG.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHANE FANG whose telephone number is (571)270-7378. The examiner can normally be reached on Mon.-Thurs. 8 a.m. to 6:30 p.m. EST..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Sample can be reached on (271)272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David R. Sample/
Supervisory Patent Examiner
Art Unit 4131

s.f.